

**REMARKS**

After entry of this Amendment, claims 1, 3-7 and 9-36 will remain in this case.

**Request to withdraw finality of Final Office Action**

During a telephone interview with examiners Hall and Neckel, examiner Hall agreed to update the search based upon the clarification of south and north side supports provided during the interview. Accordingly, applicant requests that the finality of the prior office action be withdrawn and that a new Office action be provided in response to this Amendment.

Claims 1 and 3 have been rejected as anticipated by Prideaux.

Claims 4-7, 9-21 and 22-36 have been rejected over US patent number 6,058,930 to Shingleton alone or in view of the Osterwisch and Laing patents. As pointed out in the prior amendment, it appears that the Osterwisch and Laing patents have not been cited by the applicant or by the Examiner on a form PTO-892. Appropriate correction is requested.

**The Claimed Invention****Claims 1 and 3**

Claim 1 was previously amended to specifically clarify that the solar panels are secured to the torsion to an acute angle to the torsion tube axis with the solar panels located entirely vertically above the torsion tube axis at the noontime angular orientation.

An example of the invention of claim number 1 is shown in Figs. 19-24 and discussed in the related paragraphs 58-60. Paragraph 59 discusses the significance of this invention and some of the advantages accruing with this invention.

**[0059]** It has previously been assumed that because the major design determinant for the torque tube size and cost is the torque on the torque tube, that it was essential to minimize both the torque generated by dead weight and the torque generated by wind force. However, through detailed investigations and analyses it has been determined that 1) the wind torque is actually highest when the torque tube rotational angle is relatively low (for example 10-20 degrees) and lowest when the rotational angle is highest (typically 45 degrees); and 2) the dead load torque is lowest at relatively low rotational angles and highest at high rotational

angles. Therefore, increase in y distance to the cg of the tilted PV modules 34A of Figs. 19-24 does not lead to a significant increase in the design maximum torque delivered to the torque tube. Based upon this quite unexpected result, it has been determined that the size and cost of the torque tube does not increase significantly for the tilted (Figs. 19-22) vs. horizontal (Figs. 1-18) configurations.

#### Claims 4-7 and 9-36

Examples of the invention of claims 4-7 and 9-36 are shown in Fig. 25-33 and discussed in paragraphs 61-73. As an aid in understanding the invention of claim 4, applicant provides the following annotated and amended claim 4, with particular reference to Figs. 25 and 28.

4. (Currently amended) A tracking solar collector assembly 200 comprising:
  - first and second tracking solar collectors [202 associated with Southside supports 212, 213];
  - first and second Southside supports 212, 213;
  - first, second and third North side supports 216, 217, 218;
  - the Southside supports and the North side supports defining first and second generally parallel paths, the first and second paths being generally East-West paths, the first and second paths being spaced apart from one another [these east west paths are defined by a line connecting Southside supports 212, 213, 214, and by a line connecting North side supports 216, 217, 218];
  - the first tracking solar collector comprising a first solar collector structure [includes torque tube 236 and module rails 238];
  - the second tracking solar collector comprising second solar collector support structure [includes torque tube 236 and module rails 238];
  - the first and second solar collector support structures each having first and second spaced apart pivotal support points 224, 232 defining a tilt axis 237;
  - at least one solar collector 240 mounted to each solar collector support structure;
  - the first support point of each of the first and second solar collector support structures pivotally connected to and supported by the first and second Southside supports 212, 213, respectively;
  - the second support point 232 of the first solar collector support structure pivotally connected to and supported by the first and second North side supports 216, 217;

the second support point 232 of the second solar collector support structure pivotally connected to and supported by the second and third North side supports 217, 218; and

a tilting assembly comprising:

a drive element 250 secured to each solar collector support structure;

a drive element coupler 248 operably coupling the drive elements, the drive elements and the drive element coupler creating a drive assembly; and

a driver 206 coupled to the drive assembly so that operation of the driver causes the drive elements move in unison thus causing the solar collector support structures and the solar collectors therewith to tilt in unison.

### The Cited Art

**Prideaux** discloses two basic embodiments.

- Figs. 1-2B discloses a prior art embodiment including a torque tube 16 supported by a number of support posts 18. PV panels 12 are mounted to the torque tube 16 at an acute angle to the torque tube and on either side of the torque tube. Rotation of the torque tube 16 allows the PV panels 12 to track the sun. A "major disadvantage with this technique is that it requires an unduly large amount of space for any given number of longitudinally spaced panels." (2/44-46) "Another disadvantage of system 10 indirectly results from the large spacing requirement between adjacent panels." (2/57-59)
- Fig. 3-4 show PV panels 32 mounted to and below torque tube 40. Torque tube 40 is supported for rotation about a torque tube axis 38 by support posts 42. The plane of the PV panels 32 remains parallel to axis 38 as the panels are rotated about the axis. (4/65-68) Advantages of the invention of Figs. 3-4 over the prior art of Figs. 1-2B include the elimination of the "necessity to spaces adjacent panels from one another for purposes of preventing one panel from shading another" (3/13-15) and "the solar collecting front sides of the panels are maintained in an end-to-end relationship with one another within a common plane and face in the same direction." (3/28-31)

**Shingleton**, at Figs. 2A-2C, 9A and 10 illustrate solar tracker array 30. Each array includes a row of solar panels 34 supported by a torque tube 32 which is journaled in bearings 40 on top of piers 36. The piers 36, and therefore the row of solar panels 34, are oriented in a north/south direction.

(See claim 1.) Torque tube 32 is rotated about its axis by a linear actuator 42 so that the row of solar panels 34 can be tilted from an east facing orientation (Fig. 2B) to a mid-day orientation (Fig. 2A), to a west facing orientation (Fig. 2C). Adjacent rows of solar panels 34 may be tilted or racked back and forth by separate actuators 62 (Fig. 7) or by using the same linear actuator 42 (Figs. 8-10) by coupling the ends of adjacent torque arms 46 to one another using link members 68.

**Osterwisch** discloses a drive mechanism 10 including a lower bar 12 pivotally connected to a pedestal 16 and an upper bar 14 pivotally connected to lower bar 12 and to a support arm 18. Pedestal 16 is fixed to ground 20. (3/14-23) Linear actuator 32 has one end connected to support arm 18 and the other end connected to the junction of bars 12, 14. (3/58-62) The lower bar 12, upper bar 14, pedestal 16 and a support arm 18 create a 4-bar linkage to permit 180° elevational rotation by the actuation of linear actuator 32. "The linear actuator member acts as a strut or a brace that assists the mechanism in resisting compression and tension forces." (2/30-41)

**Laing** discloses at Fig. 1 a solar concentrator including a water-filled a concrete trough 1 in which a steel frame 2 floats. Ropes 3, 4 run perpendicular to each other and are supported by frame 2. The frame is centered and rotated by rollers 8. The movement of frame 2 is such that ropes 4 remain parallel to the sun's rays. (4/10-23) Fig. 3 shows a modular energy conversion unit including a frame 36 and a roof element 30 supported by and connected to frame 36 by metal struts 34 and cables 34a. Roof element 30 acts as a Fresnel lens to concentrate solar radiation onto a focal line 39. Ropes 3 and 4 are connected where they cross and act to guide and position each energy conversion unit. The Fig. 4 embodiment uses struts 44 offset from the center of the unit so as not to obstruct the sun's rays.

### The Cited Art Distinguished: Summarized Arguments

#### Claim 1 versus Prideaux

1. Prideaux shows prior art embodiment figures 1-2B and the claimed invention of figures 3 and 4.
2. Prideaux distinguishes figures 3, 4 from figures 1-2B and outlines disadvantages of the prior art figures 1-2B embodiment.
3. Figures 1-2B show PV panels 12 on the sides of torque tube 16.
4. Figures 3, 4 show PV panels 32 mounted parallel to and below the torque tube 40.

Prideaux does not show solar panels mounted an acute angle to the torque tube axis entirely above the torque tube axis at a noontime orientation.

Accordingly, claim 1 is allowable over Prideaux.

Claim 4 versus Shingleton

1. Shingleton does not show the following elements of claim 4.

the second support point 232 of the first solar collector support structure pivotally connected to and supported by the first and second North side supports 216, 217;

The second support point of the first solar collector support structure (associated with the first solar collector) of Shingleton is only connected to one north side support (that is pier 36).

the second support point 232 of the second solar collector support structure pivotally connected to and supported by the second and third North side supports 217, 218;

The second support point of the second of solar collector support structure of Shingleton is only connected to one north side support (that is pier 36).

2. The following differences are found comparing claim 4 with the Shingleton.
  - a. The South side and north side supports of Shingleton define north/south paths, not east/west paths as claimed.
  - b. The paths defined by the South side and the north side supports of Shingleton are not spaced apart from one another as claimed.
  - c. The first and second solar collector support structures of Shingleton do not have first and second spaced apart pivotal support points defining a tilt axis as claimed.
  - d. None of the support points of Shingleton are pivotally connected to first and second north side supports.
  - e. Finally, none of the support points of Shingleton are pivotally connected to second and third north side supports.

Therefore, claim 4 is allowable over the cited art.

**The dependent claims** are directed to specific novel subfeatures of the invention and are allowable for that reason as well as by depending from novel parent claims. Based upon the telephonic interview and the Examiner's agreement to update the search and provide a new Office action, specific distinctions regarding the dependent claims will not be made in this Summarized Arguments section.

In light of the above remarks and the amendments to the claims, applicant respectfully submits that the application is in condition for allowance, and action to that end is urged. If the Examiner believes a telephone conference would aid the prosecution of this case in any way, please call the undersigned at (650) 712-0340.

The Commissioner is hereby authorized to charge any fee determined to be due in connection with this communication, or credit any overpayment, to our Deposit Account No. 50-0869 (PWRL 1030-3).

Respectfully submitted,

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/James F. Hann/

James F. Hann, Reg. No. 29,719

HAYNES BEFFEL & WOLFELD LLP  
P.O. Box 366  
Half Moon Bay, California 94019  
Phone: 650-712-0340  
Fax: 650-712-0263